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(54) BASE FILM FOR PHOTOGRAPHING FILM

(57)Abstract:

PROBLEM TO BE SOLVED: To prepare a base film for photographic films consisting essentially of polyethylene-2,6-naphthalene dicarboxylate which is good in the form of a roll at the time of taking up the film in a roll form and is lessened in the occurrence of the flatness defect of the film induced by the form defect of the roll.

SOLUTION: This photographic film is the biaxially stretched polyethylene-2,6- naphthalene dicarboxylate film which is subjected to embossing at both side ends of the film and at ≥ 1 points of the intermediate parts and has 40 to 120 μm thickness. The height of the embossing is 5 to 40 μm and the difference in the height of the ≥ 2 embossments existing on the straight line intersecting perpendicular with the longitudinal direction (MD) of the film is $\leq 10\mu\text{m}$.

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 CLAIMS

[Claim(s)]

[Claim 1] Performed embossing to a film both-sides edge or one or more places of this both-sides edge and this pars intermedia. It is biaxial-stretching polyethylene -2 and 6-naphthalene dicarboxy rate film whose thickness is 40-120 micrometers. A base film for photographic films characterized by that a difference of height of two or more embossing is 10 micrometers or less existing on a straight line which height of embossing is 5-40 micrometers, and crosses a right angle to a longitudinal direction (MD) of a film.

[Claim 2] A base film for photographic films according to claim 1 characterized by for a rate of a heat shrink of a film longitudinal direction when holding a film in 110 degrees C for 24 hours being 0.25% or less, and a difference (rate of a rate of MD heat shrink (max)-MD heat shrink (min)) of maximum in the film cross direction of a rate of a heat shrink of a parenthesis and the minimum value being 0.10% or less.

[Claim 3] A base film for photographic films according to claim 1 or 2 characterized by a rate of a heat shrink of the film cross direction (TD) when holding a film in 110 degrees C for 24 hours being 0.25% or less.

[Claim 4] A base film for photographic films according to claim 1 characterized by whenever [between films / HARITSUKI] being the 3rd less than class.

[Claim 5] A base film for photographic films according to claim 1 which a film is heat-treated at temperature of glass transition point (Tg) of polyethylene -2 and 6-naphthalene dicarboxy rate - (Tg-40) **, and is characterized by anti-curling nature in 80 degrees C being below 50 [m-1] in an ANSI curl value.

[Claim 6] Polyethylene -2, a base film for photographic films according to claim 1 characterized by ethylene -2 and 6-naphthalene dicarboxy rate unit occupying at least 97% of all repeat units in 6-naphthalene dicarboxy rate.

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 DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the polyethylene -2 with which generating of the poor smoothness of the film which is excellent in the roll gestalt at the time of rolling round a film in the shape of a roll in more detail about the base film for photographic films, and is caused by the poor gestalt of a roll was reduced, and the base film for photographic films which becomes considering 6-naphthalene dicarboxy rate as a main component.

[0002]

[Description of the Prior Art] There are what is used with **** roll-like films, such as a negative film which loads a common camera with, and which is used for photography, and a thing to use with **** sheet-like films, such as a film for X-rays, a film for platemaking, and a cut film, in a photographic film.

[0003] A triacetyl cellulose (it may be called "TAC" for short below) film is mainly used for the base film of this roll-like film, and the biaxial-stretching polyester film which consists of polyethylene terephthalate is mainly used for the base film of a sheet-like film.

[0004] TAC -- a film -- optical -- an anisotropy -- there is nothing -- transparency -- being high -- things -- further -- a plastic film -- ***** -- comparatively -- absorptivity -- being high -- a sake -- a roll film - - ***** -- winding -- having had -- a condition -- passing -- the time -- carrying out -- having -- things - - being generated -- curliness -- curl -- a development -- water absorption -- depending -- a chain -- a rearrangement -- a sake -- a dissolution (curl dissolution nature) -- carrying out -- ** -- saying -- having

[0005] However, it is necessary to also miniaturize the cartridge which contains a photographic film with the advance of a miniaturization of photography equipment etc. recently, and it came to be required that the base film for photographic films used for this is conventionally considered as closing in and that it should have engine performance with a mechanical strength and dimension stability sufficient also as closing in. However, when thickness is made thin, a mechanical strength cannot be insufficient and it cannot be satisfied with a TAC film of a demand.

[0006] On the other hand, although a biaxial-stretching polyethylene terephthalate film has the outstanding mechanical property, transparency, dimensional stability, thermal resistance, chemical resistance, etc., since the capacity (it may be called "anti-curling nature" below) which make it hard to tend to attach curliness curl to a film, and to attach this curl is insufficient when it is used having wound in the shape of a roll, it is difficult to use for the base film of a roll-like film, and it is used as a sheet-like film as mentioned above.

[0007] As a method of giving core set dissolution nature to polyester film, the method of heat-treating this film at the temperature below the glass transition point (Tg) of polyester is learned. However, the biaxial-stretching polyethylene terephthalate film which performed this heat-treatment also runs short of core set dissolution nature.

[0008] Moreover, when the slipping nature of polyester film is bad, since films will cause blocking if a film is rolled round in the shape of a roll as it is, even if rolling up becomes impossible and it is able to

roll round, defects, such as a scratch, will occur frequently on a film front face. As a method of raising this rolling-up nature, the technique of performing embossing processing to a film both-sides edge is known. While carrying out a deer If a difference may arise in the height of embossing which was given to the film and which adjoins, respectively as a result of examination of this invention person and this difference is large When a film is rolled round in the shape of a roll, smoothness should get worse [a film] by generating of torsion and Siwa etc., Aggravation of smoothness will become more remarkable if it furthermore heat-treats at the temperature of T_g with this condition (condition wound around the roll) (T_g-40), Thus, when the smoothness of a base film got worse, and it was subsequent sensitive-material spreading, it became clear to become the cause which causes spreading spots.

[0009]

[Problem(s) to be Solved by the Invention] The object of this invention has a good roll gestalt at the time of rolling round a film in the shape of a roll, and it is to offer the polyethylene -2 with which generating of the poor smoothness of the film caused by the poor gestalt of a roll was reduced, and the base film for photographic films which becomes considering 6-naphthalene dicarboxy rate as a main component.

[0010]

[Means for Solving the Problem] According to this invention, the object of this invention performed embossing to a film both-sides edge or one or more places of this both-sides edge and this pars intermedia. It is the biaxial-stretching polyethylene -2 and 6-naphthalene dicarboxy rate film whose thickness is 40-120 micrometers. It is attained by base film for photographic films characterized by that a difference of height of two or more embossing is 10 micrometers or less existing on a straight line which height of embossing is 5-40 micrometers, and crosses a right angle to a longitudinal direction (MD) of a film.

[0011] The biaxial-stretching polyethylene -2 in this invention and 6-naphthalene dicarboxy rate film are a range whose thickness is 40-120 micrometers, and a thing which is in the range of 50-100 micrometers preferably. Since a deflection of a film at the time of rolling round a film after film production on a roll since mechanical strengths run short that this thickness is less than 40 micrometers or flexural strength of a film falls becomes large and a roll gestalt worsens, it is not desirable. On the other hand, since semantics of thin-film-izing of a film will be lost if thickness exceeds 120 micrometers, it is not desirable.

[0012] As for the above-mentioned biaxial-stretching polyethylene -2 and 6-naphthalene dicarboxy rate film, embossing is further performed to a film both-sides edge or one or more places of this both-sides edge and this pars intermedia. This embossing is continuously performed to a film longitudinal direction (the direction of MD). About a part which performs embossing processing, as long as it has considered so that trouble may not be caused in under-coating processing or emulsion spreading of a up to [a base film], how many places may be in interstitial segments other than film both ends or film both ends, and both ends. Moreover, a method which will not be limited especially if it is the method of giving continuous irregularity by embossing etc. to a longitudinal direction (the direction of MD) of a film about an embossing art, for example, is already shown in well-known JP,47-16064,B can be used.

[0013] Height of embossing in this invention is 5-40 micrometers, and is 10-30 micrometers still more preferably. if it rolls round, without performing embossing processing on a film or rolls round in the condition that height of embossing is lower than 5 micrometers, blocking of films and films should grind -- in case it is alike, and a finer blemish occurs and also it is heat treatment of a roll-like film, since it is volume tightness and an imprint of the poor smoothness by blocking and a core occurs, smoothness as an object for photographic films will become dissatisfied. On the other hand, since the volume figure of a roll itself will become instability and roll deformation at the time of volume gap and roll conveyance at the time of roll rolling up and deformation by volume tightness in the case of roll heat treatment will take place to instead of [which these problems do not generate] further if height of embossing exceeds 40 micrometers, it is not desirable.

[0014] Furthermore, the above-mentioned embossing requires that that a difference of height of two or more embossing is 10 micrometers or less should exist on a straight line which crosses a right angle to the direction of film straight side (MD), and is 5 micrometers or less especially preferably 7 micrometers

or less preferably. Since a film is generated by torsion and Siwa and the smoothness of a film gets worse when a difference of height of this embossing exceeded 10 micrometers and a film is rolled round in the shape of a roll, it is not desirable. Furthermore, if a roll is heat-treated at temperature of glass transition point (Tg) of polyethylene -2 and 6-naphthalene dicarboxy rate - (Tg-40) ** while a roll gestalt has been in a bad condition, since it winds and becomes tight at an ununiformity, aggravation of smoothness will become more remarkable and is not desirable.

[0015] When the biaxial-stretching polyethylene -2 in this invention and 6-naphthalene dicarboxy rate film hold a film in 110 degrees C for 24 hours, a rate of a heat shrink of a film longitudinal direction (the direction of MD) is 0.25% or less, and it is desirable that a difference (rate of a rate of MD heat shrink (max)-MD heat shrink (minimum)) of maximum in the cross direction of a rate of a heat shrink of a parenthesis and the minimum value is 0.10% or less. When a rate of a heat shrink of a film longitudinal direction at the time of holding in 110 degrees C for 24 hours exceeded 0.25% and it carries out in the state of a roll which it rubbed with a film transport roll, and a fine blemish occurred, and rolled round heat-treatment below Tg when heat-treatment below Tg was performed into film transport, for example, adhesion or the poor smoothness which are depended for rubbing of films generate and are not desirable. Since adhesion and **** of films will occur and the smoothness of a film will be spoiled on the other hand in case sag arises on a film in the case of heat-treatment below Tg and a film is rolled round next if variation (difference of maximum of a rate of a heat shrink and the minimum value) in the film cross direction of a rate of a heat shrink of a film longitudinal direction at the time of holding in 110 degrees C for 24 hours (MD) exceeds 0.10%, it is not desirable.

[0016] A rate of a heat shrink of a film longitudinal direction at the time of holding in 110 degrees C for 24 hours is 0.25% or less. and as a method for making the range of variation in the film cross direction of this rate of a heat shrink 0.1% or less For example, a film is made to convey on a heating conveyance roll until it carries out biaxial stretching, and it rolls round on a roll after carrying out heat setting. A method of decelerating speed of a conveyance roll after a heating conveyance roll, a method of heating at IR heater between conveyance rolls with which two speed differs, Making a film convey on a method of separating both ends of a film in the middle of a heat setting zone after a horizontal drawing, taking over to a speed of supply of a film, and decelerating speed, and a nozzle which blows off a heat setting post heating wind After rolling round with a method of slowing down speed of taking over rather than speed of supply, or a film production machine, By the time it performs heat treatment below Tg, a film will be made to convey on a heating conveyance roll. There is a method of slowing down roll speed after a heating zone from roll speed in front of a heating zone etc. making a heating zone at the inside of a method of slowing down speed of a conveyance roll, or heating oven, or IR heater convey, and which method may be used. Moreover, if this invention is *****-ized processing in which it falls within a range of variation in the range of the above-mentioned rate of a heat shrink, and the film cross direction of a rate of a heat shrink of a film longitudinal direction, it will not be limited to these.

[0017] When the biaxial-stretching polyethylene -2 in this invention and 6-naphthalene dicarboxy rate film hold a film in 110 degrees C for 24 hours, it is desirable that a rate of a heat shrink of the film cross direction (the direction of TD) is 0.25% or less. This rate of a heat shrink can be made small by the time of reduction processing of a rate of a heat shrink of the above-mentioned film longitudinal direction, or this method.

[0018] Whenever [between the film/film of a portion which has not performed embossing / HARITSUKI] is the 3rd less than class preferably further, and the biaxial-stretching polyethylene -2 in this invention and the 2.5th less than class of 6-naphthalene dicarboxy rate film are the 2nd less than class especially preferably more preferably. It is hard to slide on a film, so that a grade of whenever [this HARITSUKI] is large, and an inclination to be easy to slide on films is shown, so that a grade is small. If whenever [this HARITSUKI] is larger than the 3rd class, slipping of films is bad, and it is not desirable when using it for a roll as becoming easy to produce a cob-like projection and an object for photographic films at the time of generating of a scratch with generating of blocking of films, a conveyance roll at the time of film transit, etc., and roll winding up.

[0019] As for the biaxial-stretching polyethylene -2 in this invention, and 6-naphthalene dicarboxy rate

film, it is desirable to have further a property, i.e., anti-curling nature, in which curliness curl cannot be attached easily, for example, it is desirable that anti-curling nature in 80 degrees C is below 50 [m-1] in an ANSI curl value. These 80 degrees C are the order-of-magnitude value of a maximum temperature to which a photographic film may usually be put in everyday life. an ANSI curl value -- 50 [m-1] -- if large, handling at a development process of a photograph becomes difficult, and it is not desirable.

[0020] Although assessment of curliness of the former and a photographic film had required curliness curl for how much it is canceled through usual development or a usual desiccation process of a photographic film, if it is a base film for photographic films which is the above-mentioned ANSI curl value, it will become the thing excellent also in curl dissolution nature that curliness curl which is excellent in a property, i.e., anti-curling nature, in which curliness curl cannot be attached easily, and was once generated is canceled easily.

[0021] The above-mentioned ANSI curl value can be given by heat-treating a roll film at temperature of $^{**}(T_g-40)$ - T_g . Time amount of this heat treatment has 0.1 - 1500 desirable hours on productive efficiency. If heat treatment temperature is lower than $^{**}(T_g-40)$, since heat treatment takes very long time amount and productive efficiency worsens, it is not desirable. On the other hand, when heat treatment temperature exceeds T_g , anti-curling nature comes (a core set becomes easy to be attached) to be inferior.

[0022] Although the biaxial-stretching polyethylene -2 in this invention and 6-naphthalene dicarboxy rate film become considering polyethylene -2 and 6-naphthalene dicarboxy rate as a substantial raw material, ethylene -2, a homopolymer which makes 6-North America Free Trade Agreement Ieren dicarboxy rate all repeating units, or a copolymer whose at least 97% of all repeat units are ethylene 2 and 6-naphthalene dicarboxy rate is preferably used for this polyethylene -2 and 6-naphthalene dicarboxy rate. Since anti-curling nature becomes good for rates of ethylene 2 and 6-naphthalene dicarboxy rate unit to be 97% or more of all repeat units, it is desirable, and it is desirable that it is especially 98% or more.

[0023] As a copolymerization component which constitutes a copolymer, a compound which has two ester plasticity functional groups can be used for intramolecular. For example, oxalic acid, an adipic acid, a phthalic acid, isophthalic acid, a terephthalic acid, **** dicarboxylic acid; p-oxy-benzoic acids, such as 2, 7-naphthalene dicarboxylic acid, and diphenyl ether dicarboxylic acid, **** hydroxy acid; or propylene glycols, such as p-oxyethoxy benzoic acid, **** dihydric alcohol, such as a trimethylene glycol, tetramethylene glycol, hexamethylene glycol, cyclohexane dimethylene alcohol, neopentyl glycol, and a diethylene glycol, can be used preferably.

[0024] Moreover, polyethylene 2 and 6-naphthalene dicarboxy rate may be copolymerized within limits from which 1 functionality compounds, such as a benzoic acid and a methoxy polyalkylene glycol, may block a part or all of a hydroxyl group of an end, and/or a carboxyl group, or linear polymer is substantially obtained with an ester plasticity compound of three or more organic functions of **** , such as a glycerol of **** small quantity, and pentaerythritol.

[0025] The above-mentioned polyethylene -2 and 6-naphthalene dicarboxy rate can be made to contain an additive, for example, a stabilizer, lubricant, an ultraviolet ray absorbent, a flame retarder, a color, etc. by request.

[0026] In order to give slipping nature to a film, it is desirable to carry out few rate content of the inactive particle. As this inactive particle, a heat-resistant organic particle like a spherical silica, a calcium carbonate, an alumina, a titanium dioxide, a kaolin, clay, a barium sulfate, an inorganic particle like a zeolite or a bridge formation silicone resin particle, and a bridge formation polystyrene particle can be mentioned, for example. By reasons nil why an inorganic particle has a uniform particle size etc., it is more desirable than a natural article that they are synthetic compounds, and an inorganic particle of all crystalline forms can be used.

[0027] As for mean particle diameter of the above-mentioned inactive particle, it is desirable that it is the range of 0.05-1.5 micrometers. Especially, when an inactive particle is an inorganic particle, it is desirable that it is the range whose mean particle diameter is 0.1-0.8 micrometers, and it is still more desirable that it is 0.2-0.5 micrometers. When an inactive particle is a bridge formation silicone resin

particle, it is desirable that it is the range whose mean particle diameter is 0.1-1.5 micrometers.

Moreover, when an inactive particle is a bridge formation polystyrene particle, it is desirable that it is the range whose mean particle diameter is 0.1-1 micrometer.

[0028] When mean particle diameter of an inactive particle is smaller than 0.05 micrometers, the improvement effects, such as the slipping nature of a film, *****-proof, or rolling-up nature, are small, and since the transparency of a film will fall if another side mean particle diameter is larger than 1.5 micrometers, it is not desirable.

[0029] As for a content of an inactive particle, it is desirable that it is 0.001 - 0.2 % of the weight. When an inactive particle is an inorganic particle, it is still more desirable that it is 0.001 - 0.1 % of the weight, and it is desirable that it is especially 0.002 - 0.05 % of the weight. Moreover, when an inactive particle is a bridge formation silicone resin particle, it is desirable that it is 0.001 - 0.1 % of the weight, and it is especially desirable that it is 0.001 - 0.01 % of the weight further 0.001 to 0.02% of the weight. When an inactive particle is a bridge formation polystyrene particle, it is desirable that it is 0.001 - 0.05 % of the weight. At less than 0.001 % of the weight, the slipping nature of a film tends to serve as [an addition of this inactive particle] imperfection, if it, on the other hand, exceeds 0.2 % of the weight, a film haze will increase, transparency becomes inadequate, and it is not desirable.

[0030] As long as an addition stage of an inactive particle is a phase until it produces polyethylene -2 and 6-naphthalene dicarboxy rate, there is nothing, you may add in a polymerization phase, and especially a limit may be added in the case of film production.

[0031] Generally a refractive index of polyester film is larger than a refractive index of sensitive material or air. For this reason, if polyester film is used for a base film of a photographic film, since it will be easy to reflect light which advanced from an edge of a base film by interface of a film and a sensitization agent layer and will be easy to reflect also by interface of a film and atmospheric air, light reaches to a sensitization agent layer of a portion which is separated from the edge section, and tends to cause the so-called light brake-lines phenomenon (fogging). In order to prevent such a phenomenon, it is desirable to make a color contain in a film. What was excellent in thermal resistance in film production temperature as this color, and was excellent in compatibility with polyester is desirable. Especially since a color which has an anthraquinone frame is excellent in thermal resistance and compatibility from the above-mentioned point, it is desirable. When depth-of-shade measurement in a visible-ray field is performed using an optical-density meter made from X-Rite, as for dyeing concentration, it is desirable that it is [or more at least 0.03] 0.17 or less. If the depth of shade is lower than 0.03, the prevention effect of a light brake-lines phenomenon is inadequate, and it is not desirable. Moreover, if the depth of shade is higher than 0.17, since transparency as a base film for photographic films is lost, it is not desirable.

[0032] The biaxial-stretching polyethylene -2 in this invention and 6-naphthalene dicarboxy rate film can be manufactured on a method and conditions which were known from the former or were accumulated in this industry.

[0033] For example, biaxial-stretching polyethylene -2 and 6-naphthalene dicarboxy rate film can be advantageously manufactured by performing relaxation processing, after it carries out biaxial stretching of the unstretched film obtained by usual method and it carries out heat setting. If it states still more concretely, after carrying out biaxial stretching of the unstretched film to length and a longitudinal direction by 2.0 to 5.0 times as many draw magnification as this, respectively at temperature of glass transition point (Tg) of polyethylene -2 and 6-naphthalene dicarboxy rate - (Tg+60) **, heat setting will be carried out for 1 - 100 seconds by ** (Tg+50) - (Tg+140) **. After extending in a longitudinal direction after extending to a lengthwise direction about a method of biaxial stretching, and extending in a longitudinal direction, you may extend to a lengthwise direction. Furthermore, biaxial stretching may be simultaneously carried out to three-step drawings (for example, length, width, length, etc.), four-step drawings (length, width, length, width, etc.) or length, and a longitudinal direction. Then, relaxation processing is performed to a film until it rolls round on a roll. As a relaxation art, separate both ends of a film in the middle of a heat setting zone, and it sets under temperature below a melting out temperature more than Tg of a film, for example. It heats at IR heater between two conveyance rolls with which a

method of taking over to a speed of supply of a film and decelerating speed differs from speed. Making a film convey on a method of decelerating speed of a conveyance roll after heating, and a heating conveyance roll, and making a film convey on a method of decelerating speed of a conveyance roll after a heating conveyance roll, and a nozzle which blows off a heat setting post heating wind After rolling round with a method of slowing down speed of taking over rather than speed of supply, or a film production machine, By the time it performs heat treatment by $T_g - (T_g - 40) ^{**}$, a film will be made to convey on a heating conveyance roll. There is a method of slowing down roll speed after a heating zone from roll speed in front of a heating zone, while making a heating zone at the inside of a method of slowing down speed of a conveyance roll or heating oven or IR heater convey etc. Which method may be used, deceleration of speed by the side of taking over is made 0.1 - 10% to speed by the side of supply, and relaxation processing is performed. Moreover, if this invention is the method that it falls within a range of variation in the range of the above-mentioned rate of a heat shrink, and the film cross direction of a rate of a heat shrink of a film longitudinal direction, it will not be limited to these.

[0034]

[Example] Hereafter, although an example explains this invention to details further, this invention is not limited to these examples. In addition, the following method measured or estimated the film property.

[0035] (1) Hold in hot blast with a rate [of a heat shrink] of 110 degrees C for 24 hours, and ask for the dimensional change before and behind this by the bottom type.

[Equation 1]

$$\text{熱収縮率} = \frac{L_0 - L}{L} \times 100 \quad (\%)$$

Here, L_0 is the gauge length before a heat shrink, and L is the gauge length after a heat shrink.

[0036] (2) Cover with a rubber board on a flat surface base whenever [HARITSUKI], and place in piles the film of two sheets which does not contain dust, dirt, etc. between films on it. The weight of the shape of a cylinder with an outer diameter [of 70mm] and a weight of 10kg is calmly carried on a film from right above, and weight is calmly removed after 10 minutes. A photograph of the contact pattern in circular [of the remains of a cylinder] is taken after 30-second neglect, the rate of the area of a HARITSUKI portion is measured, and it classifies by the 0-5th class from the following table 1.

[0037]

[A table 1]

級	ハリツキ部分の割合 (%)
0	10% 未満
1	10% 以上、30% 未満
2	30% 以上、50% 未満
3	50% 以上、70% 未満
4	70% 以上、90% 未満
5	90% 以上

[0038] (3) Anti-curling nature (ANSI curl value)

After carrying out temporary immobilization of the sample film of 120mmx35mm magnitude so that it may twist around a winding core with a diameter of 7mm, it may wind and it may not return, and heating it at 80 degrees C for 2 hours, it releases from a winding core and is immersed in 40-degree C distilled water for 15 minutes. Subsequently, a 33g load is applied, a sample is hung vertically, and it heat-treats for 3 minutes at 55 degrees C. It is ANSI about the sample in the condition that curl remains. PH A curl value is computed by measuring according to the test method A of 1.29-1971, and changing an inch to the metrication.

[0039] (4) After dissolving the rate film sample of ethylene -2 and 6-naphthalene dicarboxy rate unit in a measurement solvent (CDCl₃:CF₃COOD=1:1), perform 1 H-NMR measurement and compute it with the integral ratio of each obtained signal.

[0040] (5) Compute embossing height with the difference of the thickness (t1) of the whole film including the concavo-convex section which performed embossing height embossing processing, and the film thickness (t0) of the portion which has not performed embossing processing of the close attendants of the irregularity of this embossing.

[Equation 2] Embossing height (micrometer) = t1-t0 [0041] (6) After heat-treating the smoothness film after heat treatment, a three-stage estimates the smoothness (existence of Siwa, an imprint, the blemish depended for rubbing, the poor smoothness by film adhesion, and the poor smoothness by roll deformation) of a film.

O :good ** : usable (they are those with a fault to a part) x: An activity is impossible. [0042] (7) Glass transition point (Tg)

It measures on the following conditions using the differential-scanning-calorimetry equipment DSC220 made from SEIKO Electronic industry.

Programming rate: 20 degrees C / min The amount of samples: 10mg It measures in a nitrogen air current.

It quenches, after carrying out heating fusion of the sample on the above-mentioned conditions, and it measures on the above-mentioned conditions again.

[0043] The color was contained for the silica particle with a [example 1] mean particle diameter of 0.3 micrometers 0.015% of the weight 0.005% of the weight, the cooling solidification of the polyethylene -2 and 6-naphthalene dicarboxy rate which are intrinsic viscosity 0.60 was carried out by melting extrusion and casting drum lifting from the die slit, and the unstretched film was created.

[0044] 3.3 times, biaxial stretching of this unstretched film was serially carried out to 3.0 times and a longitudinal direction (cross direction: TD), it carried out heat setting to the lengthwise direction (machine shaft orientations: MD) in them, and the biaxial oriented film whose thickness is 75 micrometers was obtained. A film is made to convey on a heating conveyance roll after heat setting, the speed of the conveyance roll after a heating conveyance roll was decelerated, and after processing so that the height of embossing may become 25 micrometers to the both ends of this biaxial oriented film, the biaxial oriented film was rolled round on the roll. In addition, the difference of the height of each embossing which exists on the straight line which crosses a film longitudinal direction (MD) at a right angle was 3 micrometers. Moreover, the rate of a heat shrink at the time of holding the obtained biaxial oriented film in 110 degrees C for 24 hours was 0.20%, and the variation in the film cross direction of the rate of a heat shrink of a film longitudinal direction (MD) was 0.05%.

[0045] The film with a width of face [of 1000mm] and a length of 2000m was sampled from the obtained biaxial oriented film, this was rolled round to the winding core with a diameter of 165mm, and it considered as the sample roll. In this condition, temperature up was carried out over 24 hours to 100 degrees C, heat treatment lowered to a room temperature over 24 hours was carried out after holding at 100 degrees C for 24 hours, and the biaxial oriented film whose thickness is 75 micrometers was obtained.

[0046] Before heat-treating a biaxial oriented film, the smoothness (existence of the poor smoothness by Siwa, an imprint, and roll deformation) of the film after heat-treating was checked. The physical properties of the film before heat treatment and the smoothness of the film after heat treatment are

shown in a table 2.

[0047] The film was similarly produced except having set the height of embossing to 5 micrometers and having rolled it round in the [example 2] example 1. A result is shown in a table 2.

[0048] The film was similarly produced except having set the height of embossing to 40 micrometers and having rolled it round in the [example 3] example 1. A result is shown in a table 2.

[0049] The film was similarly produced except having set the difference of the height of each embossing to 10 micrometers, and having rolled it round in the [example 4] example 1. A result is shown in a table 2.

[0050] The film was similarly produced except having performed and rolled round embossing processing in the [example 5] example 1 to a total of four places of the both ends of a film, and two center sections. A result is shown in a table 2.

[0051] Except that the rate of a heat shrink at the time of leaving it in 110 degrees C for 24 hours in the [example 6] example 1 was 0.25%, the film was produced similarly. A result is shown in a table 2.

[0052] Except that the range of the variation in the width direction of the rate of a heat shrink of MD (lengthwise direction) of the film at the time of leaving it in 110 degrees C for 24 hours in the [example 7] example 1 was 0.10%, the film was produced similarly. A result is shown in a table 2.

[0053] The film was similarly produced except having set the height of embossing to 50 micrometers in the [example 1 of comparison] example 1. A result is shown in a table 2.

[0054] The film was similarly produced except having set the height of embossing to 3 micrometers in the [example 2 of comparison] example 1, and having set the difference of the height of embossing to 1 micrometer. A result is shown in a table 2.

[0055] The film was similarly produced except having set the difference of the height of embossing to 14 micrometers in the [example 3 of comparison] example 1. A result is shown in a table 2.

[0056] The film was similarly produced except having set thickness of a film to 30 micrometers in the [example 4 of comparison] example 1. A result is shown in a table 2.

[0057]

[A table 2]

	実施例 1	実施例 2	実施例 3	実施例 4	実施例 5	実施例 6	実施例 7	比較例 1	比較例 2	比較例 3	比較例 4
ポリマー種類	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN	PEN
ポリマー純度 mol%	98	98	98	98	98	98	98	98	98	98	98
厚み μm	75	75	75	75	75	75	75	75	75	75	30
インボス高さ μm	25	5	40	25	25	25	25	50	3	25	25
各々のインボスの 高さの差 μm	3	3	3	10	3	3	3	3	1	14	3
インボス 処理位置	両端部	両端部	両端部	両端部	両端部および中央部2カ所	両端部	両端部	両端部	両端部	両端部	両端部
110℃×24h 熱収縮率 %											
ND熱収縮最大値	0.20	0.20	0.20	0.20	0.20	0.25	0.20	0.20	0.20	0.20	0.20
ND熱収縮最小値	0.15	0.15	0.15	0.15	0.15	0.20	0.10	0.15	0.15	0.15	0.15
ND熱収縮率	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
ND熱収縮の巾方 向でのバラツキ %	0.05	0.05	0.05	0.05	0.05	0.05	0.10	0.05	0.05	0.05	0.05
加熱処理 温度 $^{\circ}\text{C}$	100	100	100	100	100	100	100	100	100	100	100
時間 hr	24	24	24	24	24	24	24	24	24	24	24
抗ハリツ性 m-1	35	35	35	35	35	35	35	35	35	35	50
ハリツキ度	3	3	3	3	3	3	3	3	3	3	3
熱処理前の平面性	○	○	○	○	○	○	○	△	△	△	△
熱処理後の平面性	○	○	○	○	○	○	○	○	○	○	○
総合評価	○	○	○	○	○	○	○	○	○	○	○

[0058]

[Effect of the Invention] According to this invention, the roll gestalt at the time of rolling round a film in the shape of a roll is good, and the polyethylene -2 with which generating of the poor smoothness of the film caused by the poor gestalt of a roll was reduced, and the base film for photographic films which becomes considering 6-naphthalene dicarboxy rate as a main component can be offered.

[Translation done.]